

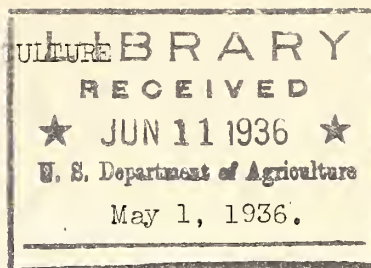
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UNITED STATES DEPARTMENT OF AGRICULTURE  
Weather Bureau  
Washington



Office of the Chief

CIRCULAR

INSTRUCTIONS FOR DAILY TRANSMISSION  
OF AIRPLANE WEATHER OBSERVATIONS

I. The following instructions will become effective May 1, 1936 and will supersede all those previously issued.

II. The airplane weather observation reports will be transmitted in a numeral code by stations which are on the airway teletype circuit, or which have Government radio facilities. Stations not on the teletype circuit or not having Government radio facilities will telegraph their reports in a word code to designated stations on the teletype circuit where they will be changed to the numeral code and placed on the circuit. Specific instructions will be issued by the Central Office, naming the designated stations in such cases.

III. The reports will be filed in time for transmission over the teletype circuit at the first "wheel" (airplane observation, APOB) schedule. Stations not on the teletype circuit, i.e., where the reports are transmitted by telegraph or radio to designated stations on the circuit, will transmit their reports in time for them to be placed on the teletype circuit at the first "wheel" schedule. The "wheel" schedules are shown on the National Teletype Communication Schedule, copies of which may be obtained from the Central Office.

IV. Stations which have been authorized to make the observations regularly later than 4:30 a. m., E. S. T., i. e., too late for the reports to be filed at the first "wheel" schedule, will file them at the earliest possible time for transmission over the teletype circuit.

V. At stations where the reports are regularly filed in numeral code before 8:11 a. m., E.S.T., when no observation has been made or the report cannot be filed by that time, a message will be filed giving the reason, e. g., "no APOB dense fog", "APOB delayed, low ceiling", or "APOB delayed, pilot late", etc. A "No APOB" message should be filed for transmission at the first "wheel" schedule whenever it is known that the complete report cannot be filed by 8:11 a. m., E.S.T.

At stations where the reports are filed in numeral code and which have been authorized to make the observations regularly later than 4:30 a. m., E.S.T., a "No APOB" message, including reason, will be filed whenever no observation has been made or the report is not ready to be filed at the time at which the reports are regularly filed at the station when it is known that the complete report cannot be filed within one-half hour of the time at which the messages are regularly filed at the station.

At stations where the reports are telegraphed in the word code when observations are delayed or missed, "No APOB" messages as indicated above, will be telegraphed to the designated stations on the circuit for retransmission on the teletype circuit.

Whenever it is known that the observations will be discontinued for a period of more than two days, "No APOB" messages will be transmitted for two days and then discontinued. The messages in such cases will state the time when observations are expected to be resumed.

VI. If, for any reason, more than one observation is made on the same day or the regular observation is made too late to file the complete report by the scheduled time, such records will be computed and the reports filed for transmission as promptly as possible. However, at stations where only one Weather Bureau man is assigned, it is not required that he remain long after hours in order to compute extra or delayed observations. In no case will a report be filed later than the day (E.S.T.), following that of the observation.

VII. Whenever it is found that erroneous data were transmitted, corrections should be filed immediately. Corrections should not be filed later than the day (E.S.T.) of the observation and should be as brief as possible consistent with intelligibility. It is desired to emphasize the need for accuracy in these reports and therefore all possible steps should be taken to carefully check the data before their transmission. The Weather Bureau officials will promptly obtain from the communications operator a copy of the transmitted report. If an error was made, it will immediately be brought to the attention of the operator for prompt transmission of the necessary correction.

In order to correct errors made at relay points, the general airway supervising Weather Bureau officials receiving these reports will immediately inspect them. When errors in transmission are found they will be promptly brought to the attention of the Bureau of Air Commerce Manager of the district in which the Weather Bureau supervising station is located. The District Managers will trace such errors to their point of origin. When an error is found which was obviously not made in transmission, the Weather Bureau station at fault should be promptly notified by mail (unless teletype or radio is believed justified) only by the Weather Bureau airway supervising station for the district in which the error originated, and a copy of the notice mailed to the Central Office.

The foregoing in VII will apply to all stations where Weather Bureau personnel compute the APOB record. Any error found in Navy APOB reports will be promptly referred by mail (unless teletype or radio is believed justified) to the Central Office only by the Weather Bureau supervising station for the district in which the error originated, from where it will be taken up with the proper authorities.

VIII. Stations which filed reports in the numeral code will, as promptly as practicable after each Saturday's observation, mail to the Central Office in an envelope marked "APOBS for Map Room", a copy of the reports for the week ending on Saturday. Prior to mailing, the messages should be carefully checked with the computed data and any changes due to corrections, or otherwise, should be clearly indicated, together with the reports as originally filed. The mailed reports should be copied on standard letter size paper. The data should be arranged vertically with the altitude of the significant levels for each observation in a column and the various elements in corresponding adjacent columns.

Stations which telegraph their report in word code to stations with teletype facilities for retransmission in the numeral code will, as soon as practicable after each Saturday's observations, mail to those stations, a carbon

copy of the coded telegraph messages for the week ending on Saturday. Prior to mailing, the messages should be carefully checked with the computed data and any changes due to corrections, or otherwise, should be clearly indicated. The stations with teletype facilities which receive these mailed copies of telegraphed code messages will decode them and carefully compare these with the corresponding numeral code messages which they originally transferred to the teletype in order to check against errors which may have been made in converting from the word to the numeral code and errors in telegraphic transmission. The original teletype messages should be typed and any changes due to corrections, or otherwise, should be clearly indicated so that the necessary corrections can be readily entered on the maps at the Central Office. These copied teletype data (not the word code) for each week ending on Saturday will be mailed by the stations on the teletype circuits as promptly as practicable to the Central Office in an envelope marked "APOBS for Map Room". These reports should be typed on standard letter size paper.

IX. The data for the "significant levels", i. e., points of change in vertical temperature or humidity gradients, will be transmitted. However, when several surfaces of discontinuity only a few hundred meters apart from one another occur, only the lowermost and uppermost surfaces of discontinuity should be transmitted. The most careful judgment should always be used in order to obviate transmitting superfluous levels which not only consume valuable time in the circuit transmission but also retard the plotting of the data at the forecast centers where all unnecessary delays must be avoided.

X. Data will be transmitted only for the ascent and only when the record extends to an elevation of 500 meters or more, above ground.

XI. The difference in elevation between two adjacent levels should not exceed 1500 meters, even though the vertical temperature and humidity gradients are constant.

XII. Whenever the difference in relative humidity between two adjacent levels exceeds 40%, an intermediate level should be transmitted.

#### XIII. NUMERAL CODE FOR USE IN TRANSMISSION BY TELETYPE OR RADIO,

(a) The data will be transmitted in the following units:

- (1) ELEVATIONS (including those of clouds and other phenomena referred to below) in tens of meters (dekameters) above sea level, e.g., 527 meters will be transmitted as 53; 1632 meters as 163; 4775 meters as 478, etc.
- (2) BAROMETRIC PRESSURE, to nearest whole millibar.
- (3) TEMPERATURE, to nearest whole degree Centigrade.
- (4) RELATIVE HUMIDITY, to nearest whole percent.
- (5) EQUIVALENT POTENTIAL TEMPERATURE, to nearest whole degree Absolute ( $^{\circ}\text{C.} + 273$ ). The range of the equivalent potential temperature is



from about 240° A to 365° A and therefore the omission of the initial figure 2 or 3 in the transmission should not be confusing.

- (6) SPECIFIC HUMIDITY, to nearest tenth of gram of water vapor per kilogram of moist air.
- (7) BAROMETRIC PRESSURE, to the nearest hundredths of an inch at 1520, 3050, and 4270 meters above sea level.

(b) The data will be transmitted in the following order:

- (1) STATION DESIGNATION.
- (2) HOUR of take-off (followed by letter "Y" indicating yesterday when reports are filed the day following that of the observation).
- (3) SURFACE DATA (barometric pressure, temperature, relative humidity, equivalent potential temperature, and specific humidity).
- (4) DATA FOR SUCCESSIVE SIGNIFICANT LEVELS (elevation above sea level, barometric pressure, temperature, relative humidity, equivalent potential temperature, and specific humidity).
- (5) CLOUDS (amount, type, direction, and elevation of lower and upper limits if determined).
- (6) PRECIPITATION (kind, elevation of lower and upper limits if encountered).
- (7) THUNDERSTORM.
- (8) ICE FORMATION (type, elevation of lower and upper limits).
- (9) SMOKE, HAZE, OR DUST (elevation of lower and upper limits).
- (10) FOG (elevation of upper limit).
- (11) TURBULENCE (elevation of lower and upper limits).
- (12) BAROMETRIC PRESSURES at 1520 m., 3050 m., and 4270 m. (m.s.l.).

(c) Oblique lines will be used to separate the data for the respective levels and spaces used to separate the individual elements for each level, see par. XIII (h).

(d) The following instructions will be used in transmitting the data listed under par. XIII (b) : (numbered sections below refer to the same sections as under par. XIII (b), excepting (13) and (14).

- (1) Use teletype call letters for station designation.
- (2) E.S.T. to the nearest hour, on 0-23 hour basis, will be used for time of take-off.
- (3) The surface data transmitted will be those pertaining to the time of take-off at the level of the instrument shelter, and will be given in the following order:
  - (i) Barometric pressure (corrected to elevation of instrument shelter),
  - (ii) Temperature,
  - (iii) Relative humidity,
  - (iv) Equivalent potential temperature (omitting the hundreds digit),
  - (v) Specific humidity, to nearest tenth gram/kg., (omitting the decimal point),
  - (vi) The specific humidity value will be followed by a slant (/), indicating the termination of data for the surface and the beginning of a sequence of values for a higher level.
- (4) The data for the first significant level will immediately follow the slant indicating the end of the surface values, and begin with the elevation of the first significant level. The order of data for this and succeeding levels will be:
  - (i) Elevation above sea level,
  - (ii) Barometric pressure,
  - (iii) Temperature,
  - (iv) Relative humidity,
  - (v) Equivalent potential temperature,
  - (vi) Specific humidity,
  - (vii) Slant (/).
- (5) The CLOUD DATA transmitted ( amount, type, direction from which they are moving, and elevation of base and top when ascertained with reasonable accuracy) will be based upon cloud observations,

- (a) By the ground observer at time of take-off,
- (b) By the pilot during the ascent for clouds not visible to the ground observer.

Clouds observed by both the ground observer and the pilot will first be reconciled. Whenever more than one layer of clouds is observed, the total amount transmitted may be more than tenths.

Ordinarily, not more than four types of clouds should be reported in any one message. These should be the types of which there are the greatest amount present, except that the lower, intermediate, and upper cloud groups should be represented whenever possible. Particular effort should be made to include two predominant layers of lower clouds when present.

The higher clouds will precede the lower in the message.

The letter "Z" will be used to indicate no cloud movement.

The letter "U" will indicate direction unknown.

The elevation of the lower and upper limits at which the airplane enters and emerges from clouds, will be given in that order following the direction indicated for the respective clouds. These elevations will be preceded by distinguishing letters in certain cases to indicate the nature of the lower and upper cloud limits as outlined below:

#### Lower limit

For base of cloud, use no distinguishing letter.

For side of cloud, use "S".

When unknown whether it is base or side, use "U".

When airplane is already in cloud and the pilot was not aware of entering it, use "N", followed by elevation at which the pilot first notices that he is in cloud.

#### Upper limit

For top of cloud, use no distinguishing letter.

For side of cloud, use "S".

When unknown whether it is top or side, use "U".



When airplane has emerged from cloud and the pilot was not aware of leaving it, use "N", followed by the elevation at which the pilot first notifies that he has emerged from cloud.

When airplane continues in cloud to the maximum elevation and does not emerge at a point higher than that at which it entered, use "C" followed by the maximum elevation reached.

Whenever the airplane does not enter the cloud and the elevation can be estimated with reasonable accuracy, the estimated elevation of the base or top or both will be given followed by the letter "E".

Estimated cloud elevations will be transmitted only when such elevations are lower than the maximum elevation reached by the airplane.

Special care must be taken so as not to confuse sides of clouds with their bases or tops.

Whenever clouds, other than Ci., Ci. St., and Ci. Cu., are transmitted and the elevation of their base is above the maximum height reached, the cloud type in the message will be followed by the letters "ABMAX" which will indicate their base to be above the maximum height reached. When it is known that their base is below the maximum height reached but their elevation cannot be estimated with sufficient accuracy, the letters "BEMAX" will be used which will indicate their base to be below the maximum height reached.

- (6) The form of PRECIPITATION encountered by the airplane will be indicated by the appropriate word, e. g., RAIN, MIST, SNOW, etc. The elevation of the lower and upper limits at which the airplane encountered and emerged from precipitation will be given in that order following the precipitation word. These elevations will be preceded by the same distinguishing letters used for clouds (see par. XIII(d)(5), to indicate the nature of the lower and upper precipitation limits. Thus, in accordance therewith, when precipitation is occurring at the ground, the elevation indicated for the lower limit will be the station elevation.
- (7) Whenever during the flight, thunder is heard, the word THUNDER will be transmitted. When lightning is seen and no thunder heard, the word LIGHTNING will be transmitted. Whenever LIGHTNING or THUNDER is reported, the direction from the station where it is seen or heard will be given with the word NEARBY or DISTANT added, depending on which is appropriate. These words will be given in the following order:

LIGHTNING NORTHWEST DISTANT

- (8) Whenever ice forms on the airplane, the type of deposit will be indicated by transmitting whichever of the following three words is appropriate (for complete description of ice formations, see pars. 159 and 160, Instructions for Making Airplane Weather Observations):

(A) ICE (to represent transparent hard ice, translucent hard ice, or opaque hard ice)

(B) RIME

(C) FROST

If more than one of the above types form, preference will be given in the order (A), (B), (C),, i.e., only one "ice" word will be sent.

When the elevations of the lower and upper limits at which the ice formation occurred are known, they will be given in that order following the "ice" word. If either of these elevations is unknown, it will be omitted. When only the lower limit is known, the elevation will be given without identification; when only the upper limit is known, the elevation will be preceded by the letter "T" (denoting TOP). When both the lower and upper limits are known, no distinguishing letters will be used.

- (9) Whenever SMOKE, HAZE, or DUST conditions prevail, excluding ordinary city smoke, or dust, the elevation of the lower and upper limits of such conditions will be reported, similar to PRECIPITATION (see (6) above). When the airplane continued in the smoke, haze, or dust layer to the maximum elevation reached, the latter elevation will be reported, preceded by the letter "C".
- (10) Whenever FOG prevails, the elevation of the top (not base) of the fog layer will follow the "fog" word, except that "ground fog" as defined in Weather Bureau Circular N will not be reported. When the airplane continued in the fog layer to the maximum elevation reached, the latter elevation will be reported, preceded by the letter "C".
- (11) Whenever TURBULENCE is encountered the elevation of the lower and upper limits of the turbulent layer, or layers, as indicated by "bumpiness" or vertical air currents, will be reported.
- (12) The pressures at the 1520, 3050, and 4270 meter (m.s.l.) levels will be transmitted in this same order. These pressures will be read to the nearest whole millibar from the Adiabatic Chart (Form 1126), but will be converted to inches and hundredths for transmission. Since the pressure at the 1520 meter level will be within the range of 24 to 26 inches, only the last two digits of the pressure at this level will be transmitted, e. g. 842 mb. will be converted

to 24.86 inches, and therefore 86 will be transmitted. (If there is doubt in decoding as to the value in whole inches it should be checked with the sea level pressure.)

The pressures at the 3050 and 4270 meter levels will generally range from 19 to 21 plus and 16 to 18 plus inches, respectively; thus it will be necessary to transmit the last three digits of the pressure at these levels, dropping the decimal point; e.g. pressure at 3050 meters is 20.61 inches, 061 should be transmitted; pressure at 4270 meters is 17.45 inches, 745 should be transmitted.

- (13) Whenever part of the data for any significant level are missing, this will be indicated by a letter "M" at the corresponding place in the message, together with a brief explanatory note added at the end of the message.
- (14) Brief notes will be added at the end of the message to report unusual or marked changes in weather conditions not otherwise provided for in these instructions, also, as explanations when data may be questionable.

(e) Standard abbreviations and modifying terms as authorized in Weather Bureau Circular N, Instructions for Airway Meteorological Service, Section XVIII; and direction arrows in accordance with page 66, par. (h)1, of that Circular, will be used in these reports.

(f) The Bureau of Air Commerce will add the filing time (local standard) and date at the end of each of these reports sent over the communication systems of that Department.

(g) The distribution of these reports over the teletype circuits will be handled by the Bureau of Air Commerce upon recommendation of the Central Office of the Weather Bureau.

(h) Following is a sample message in the numeral code:

EO4/884 10 45 05 40/ 210 793 4 25 08 47/ 356 659 -6 90 11 33/413  
 611 -9 91 15 31/ 484 558 -13 73 14 20/10 AST U AEMAX/ 10STCU  
 210 413/HVY RAIN 210 413/ LGT RAIN 119 210/ICE 356 413/  
 MDT TURBC 119 413/ 86061745/

The above will be decoded as follows:

EO4/	EL PASO, TEXAS, Hour of	
	take-off at 4 a.m., E.S.T.;	
884 10 45 05 40/	884 mbs., barometric pressure,	) at
	10° C., temperature,	) surface
	45% relative humidity,	) at
	305° A., equivalent potential	) time
	temperature,	) of
	4.0 grams/kg., specific	) take-
	humidity	) off

210 793 4 85 08 42/	2100 meters, m.s.l.	)	
	793 mbs., bar.pres.	)	at
	4°C., temp.	)	first
	85% rel. hum.	)	level
	308°A., equiv. pot. temp.	)	
	4.2 gr./kg. spec. hum.	)	
356 659 -6 90 11 33/	3560 meters, m.s.l.	)	
	659 mbs., bar. pres.	)	
	-6°C., temp.	)	at
	90%, rel. hum.	)	second
	311°A., equiv. pot. temp.	)	level
	3.3 gr./kg. spec. hum.	)	
413 611 -9 91 15 31/	4130 meters, m. s. l.	)	
	611 mbs., bar. pres.	)	
	-9°C., temp.	)	at
	91%, rel. hum.	)	third
	315°A., equiv. pot. temp.	)	level
	3.1, gr./kg., spec. hum.	)	
484 558 -13 73 14 20/	4840 meters, m. s. l.	)	
	558 mbs., bar. pres.	)	at
	-13°C., temp.	)	fourth
	73%, rel. hum.	)	level
	314°A., equiv. pot. temp.	)	
	2.0, gr./kg., spec. hum.	)	
IOAST U ABMAX/	10 Ten tenths sky covered,		
	AST Alto Stratus,		
	U Direction from which moving		
	unknown.		
	ABMAX Elevation above maximum altitude		
	reached by airplane.		
IOSTCU 210 413/	10 Ten tenths sky covered,		
	STCU Strato Cumulus,		
	↖ Moving from the southeast		
	210 Cloud base 2100 meters, m.s.l.		
	413 Cloud top 4130 meters, m.s.l.		
HVY RAIN 210 413/	Heavy rain encountered between		
	2100 meters and 4130 meters, m.s.l.		
LGT RAIN 119 210/	Light rain encountered between		
	1190 meters, i.e., surface, and 2100		
	meters, m.s.l.		
ICE 356 413/	Hard ice formed on airplane between		
	3560 meters and 4130 meters, m.s.l.		
MDT TURBC 119 413/	Moderate turbulence encountered		
	between 1190 meters, i.e., surface,		
	and 4130 meters, m.s.l.		



86061745  
(86)

24.86 inches, barometric pressure  
at 1520 meters (m.s.l.)

(061)

20.61 inches, barometric pressure  
at 3050 meters (m.s.l.)

(745)

17.45 inches, barometric pressure  
at 4270 meters (m.s.l.)

#### XIV. WORD CODE FOR USE IN TRANSMISSION BY TELEGRAPH.

(a) The same units and data will be transmitted by telegraph as by teletype and radio (par. XIII(a) and (b) ), except first, that the station designation is omitted in certain cases as explained in par. XIV(b), and second, that only even figures will be sent in certain cases as indicated in par. XIV(c) (2), (3), (6) and (15).

(b) The sequence of words to be used in the body of the message will be as listed in par. XIV(c), unless either or both of the following exceptions apply:

(1) When the place of observation is not identical with the place of filing the message, the first word as indicated in par. XIV(c)(1) will be preceded by the observation station designation. (The arrangement of the words indicated under par. XIV(c) omits the station designation since the arrangement applies to cases where the place of observation is identical with the place of filing the message. In such cases it is possible to ascertain the place of observation since the place of filing is given by the telegraph company aside from the body of the telegram.)

(2) When a report is filed on the day following that of the observation, the first word as indicated in par. XIV(c)(1) will be followed by the word YESTERDAY. (The arrangement of the words indicated under par. XIV(c) omits reference to the date since the arrangement applies to cases where the date of observation is the same as the date on which the message is filed. In such cases, it is possible to ascertain the date of observation since the date of filing is given by the telegraph company aside from the body of the telegram.)

(c) The following instructions will govern the transmission of data referred to in par. XIV(a), subject to the exceptions given in par. XIV(b).

(1) The FIRST word in the message will indicate the TIME OF TAKE-OFF, to nearest hour, E.S.T., on 0-23 hour basis.

#### EXAMPLES:

4 a.m., E.S.T., (FOUR); 2 p.m., E.S.T. (FOURTEEN).

(2) The SECOND word in the message will indicate the SURFACE BAROMETRIC PRESSURE (corrected to elevation of instrument shelter) at time of take-off, to the nearest even millibar. This word will be taken from the "Pressure-Temperature" words, pp. 19-28, Weather Code 1931, using always the first column on the page. When the value is exactly halfway between two even numbers,



the smaller even number will be used.

The units and tens place digits will be indicated by the second code element in the word and the hundreds place digit by the first letter in the word. The initial letter "U" indicates one unit of the thousands place and no hundreds place digit.

Examples:

986 (TURSIN); 879 (SURROGATE); 1022 (UNDAM).

(3) The THIRD word in the message will indicate the SURFACE TEMPERATURE AND RELATIVE HUMIDITY at time of take-off. The same set of code words will be used as for pressure. The temperature will be indicated by the first code element in the word and the humidity by the second code element.

The decimal in the temperature figure will be dropped according to the standard Weather Bureau rule for disposing of decimals, e. g., 16.5° will be changed to 16° and 13.5° to 14°. This latter value will then be doubled, thus making it possible to transmit odd values. Negative temperatures, likewise, will be doubled after disposing of the decimal, and the complement, i. e., 100 minus the value will then be coded as explained above.

When the relative humidity is exactly halfway between two even numbers the smaller even number will be used. Humidities of 3% or less, will be coded as 2%, and 100% will be coded as zero.

Examples:

14.6°	49%	(FULGOR)
11.3°	1%	(DACAPO)
22.6°	100%	(GIG)
- 3.5°	89%	(TARSOAP)
- 1.3°	56%	(TOMINA)
0.2°	82%	(USAGE)

(4) The FOURTH word in the message will indicate the SURFACE EQUIVALENT POTENTIAL TEMPERATURE at the time of take-off. The same set of code words will be used as for pressure. The following are a few examples of the coding of equivalent potential temperature:

241°A., double the digits 24 and indicate 48 which will be coded in the first code element, indicate the digit 1 in the second code element. Thus the code word GOODBYE will indicate 241°A. Similarly, 266°A., will be coded as MANUAL; 293°A., MOURNFUL; 310°A., NAIL; 335°A. NISMUR; etc.

(5) The FIFTH word in the message will indicate the SURFACE SPECIFIC HUMIDITY and shall be coded (using the same code words as for pressure), as shown in the following examples: 16.9 grams per kilogram, double the integer 16 and indicate 32 in the first code element, indicate the decimal 0.9 in the second code element, thus the code word FATTY will indicate 16.9 g./kg.; 23.2 g./kg., will be coded as GIDDY; 9.3 g./kg., BOASTFUL; 0.8g./kg., USURP; 0.1 g./kg., UNBUCKLE; etc.

(6) The SIXTH word in the message will indicate the ELEVATION ABOVE SEA LEVEL of the first level. The elevation expressed to the nearest even decimeter, will be enciphered using the same code words as for pressure. The tens

and units place digits (of the elevation in dekameters) will be indicated by the second code element in the word and the hundreds place digit by the first letter of the word:

Examples:

260 meters, (26 dekameters) UNID; 1010 meters, (100 nearest even dekameter) BULK; 2260 meters, (226 dekameters) DUDISH; 4000 meters (400 dekameters) GUY.

(7) The SEVENTH, EIGHTH, NINTH, and TENTH words in the message will indicate the BAROMETRIC PRESSURE, see par. XIV(c)(2); TEMPERATURE-RELATIVE HUMIDITY, see par. XIV(c)(3); EQUIVALENT POTENTIAL TEMPERATURE, see par. XIV(c)(4); and SPECIFIC HUMIDITY, see par. XIV(c)(5); respectively, at the first significant level, the elevation of which was indicated in the sixth word. These words will be followed in the same sequence, by words indicating the ELEVATION ABOVE SEA LEVEL of the remaining levels and the corresponding BAROMETRIC PRESSURES, TEMPERATURES, RELATIVE HUMIDITIES, EQUIVALENT POTENTIAL TEMPERATURES, and SPECIFIC HUMIDITIES.

(8) Clouds will be reported by code words taken from Weather Code 1931, pp. 59 and 60, except that the words for "calm" and "direction unknown" will be taken from the Appendix attached hereto. Cloud elevations will be coded as indicated in par. XIV(c)(6) of this Circular. The procedure for reporting clouds will follow the instructions given in par. XIII(d)(5), except that instead of the letters "S", "U", "N", "C", and "E", the corresponding words "SIDE", "UNKNOWN", "NOTICED", "CONTINUED", and "ESTIMATED" will be used to indicate these conditions whenever appropriate.

(9) PRECIPITATION actually encountered by the airplane will be reported as indicated in par. XIII(d)(6) except that words instead of letters will be used to indicate the nature of the lower and upper limits in accordance with par. XIV(c)(8) above.

(10) THUNDER and LIGHTNING will be reported in accordance with par. XIII(d)(7).

(11) ICE FORMATION on the airplane will be reported in accordance with par. XIII(d)(8), except when only the upper limit of the ice formation is known, the elevation code word will be preceded by the word "TOP". Elevations will be enciphered in accordance with instructions given in par. XIV(c)(6).

(12) SMOKE, HAZE, or DUST will be reported in accordance with par. XIII(d)(9), except that when the airplane continued in the smoke, haze, or dust layer to the maximum elevation reached, the latter elevation will be reported preceded by the word "CONTINUED". Elevations will be enciphered in accordance with par. XIV(c)(6).

(13) FOG will be reported in accordance with par. XIII(d)(10), except that when the airplane continued in the fog layer to the maximum elevation reached, the latter elevation will be reported preceded by the word "CONTINUED". Elevations will be enciphered in accordance with par. XIV(c)(6).

(14) TURBULENCE will be reported in accordance with par. XIII(d)(11).

The elevations of turbulent layers will be enciphered in accordance with par. XIV(c)(6).

(15) PRESSURES at 1520, 3050, and 4270 meters (m.s.l.) will be read to the nearest whole millibar on the Adiabatic Chart, and converted to the nearest even hundredth of an inch for transmission. Two code words will be used for transmission, taken from the "Pressure-Temperature" words, pp. 19-28, Weather Code 1931. The pressure at the 1520 meter level (transmitting only the last two digits) will be coded in the first code element of the first word. Only the last two digits of the pressures at the 3050 and 4270 meter levels will be coded in the first and second code elements, respectively, of the second word.

The second code element of the first word will be used to transmit the units digit of the pressures at 3050 and 4270 meters. This will be done as follows: the units digit of the pressure at 3050 m. and the units digit of the pressure at 4270m will be placed in sequence and doubled for transmission. In cases when the doubled figure exceeds 100, the hundreds figure should be dropped (not coded), but caution must be used in decoding. The pressures at the two upper levels in question will generally range in such a manner that the whole inch values will be as follows:

at 3050 m. 19, 20 or 21;  
and at 4270 m. 16, 17 or 18.

As only 9 combinations of units digits are possible with the above pressures, no difficulty is anticipated. These are:

06	(	transmitted	as	12)
07	(	"	as	14)
08	(	"	as	16)
16	(	"	as	32)
17	(	"	as	34)
18	(	"	as	36)
96	(	"	as	92)
97	(	"	as	94)
98	(	"	as	96)

For example: Code words used SIBERIA NUDGE

Pressure at 1520 meters is 24.86 inches; 86 should be coded in the first code element of the first code word.

Pressure at 3050 meters is 20.61 inches; 60 should be transmitted in the first code element of the second code word.

Pressure at 4270 meters is 17.45 inches; 44 should be transmitted in the second code element of the second code word.

The indicating digits (units digits) of the transmitted pressures (20.60 and 17.44) at the 3050 and 4270 meter levels are 0 and 7 respectively, or 07; doubled, 14. The figure 14 will be transmitted in the second code element of the first word. In decoding, 14 divided by 2 will become 07, the 0 indicating 20 whole inches for the pressure at 3050 meters and the 7 indicating 17 whole inches for the pressure at 4270 meters.



Should the units figures be 9 and 6 (e.g. 19.10 and 16.90), 9, 7 or 9, 8, these figures doubled will become 192, 184, 196. The 1 should be dropped for the purpose of coding. The other combinations doubled will not produce such high values, thus no difficulty in decoding them is anticipated; however in decoding, 92, 94, or 96; a figure 1 (one) must be placed before the coded value before dividing by two; thus, 92 becomes 192; divided by 2, it becomes 96, indicating a pressure of 19.10 and 16.90 at the two higher levels.

(16) Whenever part of the data for a significant level is missing, except temperature or humidity, the word MISSING will be substituted for the code word for the missing element. If both the temperature and humidity are missing then the word MISSING will be substituted for the temperature- relative humidity code word. If only one of these two elements is missing, then the missing one will be coded as ZERO with a brief explanatory note to be added at the end of the message. Such notes will also be added to report conditions referred to in par. XIII(d)(14).

(d) Following is a sample message in the word code:

FOUR SUNSET DUNGEON NUMMULAR OAK DUBUKE RUTABAGA OUTSET NUNSY OBDURE FULMINATE  
NUMOIL SOOTY NAMBY INFUSE GUIBA NUTBUSH SATURN NAMUR IMBUE GUESSERS MUSMON RETRACT  
NAGGY EACH CEZODE ABMAX CONGO DUBUKE GUIBA HEAVY RAIN DUBUKE GUIBA LIGHT RAIN BUN-  
DY DUBUKE ICE FULMINATE GUIBA MODERATE TURBULENCE BUNDY GUIBA SIBERIA NUDGE.

The above will be decoded as follows:

FOUR	Hour of take-off	
	4 a. m., E. S. T.	
SUNSET	884 mbs., barometric pressure)	
DUNGEON	10°C., temperature, 44% rela- )	at surface
	tive humidity )	at time of
NUMMULAR	305°A., equivalent potential )	take-off
	temperature )	
OAK	4.0 g./kg., specific humidity)	
DUBUKE	2100 meters, m. s. l. )	
RUTABAGA	792 mbs., bar. pres. )	at first
OUTSET	8°C., temp., 84% rel. hum. )	level
NUNSY	308 A., equiv. pot. temp. )	
OBDURE	4.2 g./kg., spec. hum. )	
FULMINATE	3560 meters, m. s. l. )	
NUMOIL	658 mbs., bar. pres. )	at second
SOOTY	- 6°C., temp., 90% rel. hum. )	level
NAMBY	311°A., equiv. pot. temp. )	
INFUSE	3.3 g./kg., spec. hum. )	
GUIBA	4120 meters, m. s. l. )	
NUTBUSH	610 mbs., bar. pres. )	at third
SATURN	- 9°C., temp., 90% rel. hum. )	level
NAMUR	315°A., equiv. pot. temp. )	
IMBUE	3.1 g./kg., spec. hum. )	

GUESSERS .	4840 meters, m. s. l.	)
MUSMON	558 <sub>0</sub> mbs. bar. pres.	) at third
RETRACT	-13 C., temp., 72% rel. hum.	) level
NAGGY	314°A., equiv. pot. temp.	)
EACH	2.0 g./kg., spec. hum.	)
CEZODE	8, 9, or 10 tenths Alto Stratus, direction unknown.	
ABMAX	Base above maximum altitude reached by airplane.	
CONGO	8, 9, or 10 tenths Strato Cumulus, moving from southeast.	
DUBUKE	Base 2100 meters above sea level.	
GUIBA	Top 4120 meters above sea level.	
HEAVY RAIN	Heavy rain encountered by airplane.	
DUBUKE	Lower limit 2100 meters above sea level.	
GUIBA	Upper limit 4120 meters above sea level.	
LIGHT RAIN	Light rain encountered by airplane.	
BUNDY	Lower limit surface (1200 meters above sealeve	
DUBUKE	Upper limit 2100 meters above sea level.	
ICE	Ice formed on airplane.	
FULMINATE	Lower limit 3560 meters above sea level.	
GUIBA	Upper limit 4120 meters above sea level.	
MODERATE		
TURBULENCE	Moderate turbulence encountered by airplane.	
BUNDY	Lower limit surface (1200 meters above sea level).	
GUIBA	Upper limit 4120 meters above sea level.	
SIBERIA	Pressure at 1520 meters is 24.86 inches. The indicating digits (units digits) of the pressures at 3050 and 4270 meters are 14 ÷ 2, or 07.	
NUDGE	The hundredths inch of the pressure at 3050 meters is 60 combined with the indicating figure (0) for the level, the pressure becomes 20.60. The hundredths inch of the pressure at 4270 meters is 44. Combined with the indicating figure (7), the pressure becomes 17.44.	



# APPENDIX

Cloud code words for "Calm" and "Direction Unknown" for use in telegraphic reports.  
 (See paragraph XIV (c) (g)).

CALM.

Cloud Type.	1/10 or less.	2 or 3 tenths	4 or 5 tenths	6 or 7 tenths	8, 9, or 10 tenths
Ci or Ci St	Cull	Curval	Curley	Cupid	Cuckoo
Ci Cu or A Cu	Catch	Calvar	Cake	Caking	Callow
A St.	Cent	Cellar	Celeste	Ceiling	Cesspool
Cu	Circum	Cicala	Cicero	Cilium	Cinco
St Cu	Cocky	Collar	Copper	Coppice	Coco
St	Chilly	Choppage	Chopper	Choking	Chico
Nb. or Cu Nb.	Clanky	Clovak	Clapper	Cracking	Crimpole
			UNKNOWN.		
Ci or Ci St.	Cuzzy	Cuzald	Cuzel	Cuzilt	Cuzolp
Ci Cu or A Cu.	Cazy	Calzan	Cazell	Cazif	Cazole
A St.	Cezule	Cezave	Cezery	Cezist	Cezode
Cu.	Cirzule	Cizalm	Cilzer	Cipzil	Cilzor
St. Cu.	Cozup	Cozate	Cozener	Cozine	Cozorp
St.	Chozy	Chizam	Chazel	Chezipe	Chazop
Nb or Cu Nb.	Clazule	Clazart	Crazed	Clezir	Crazel

